USB-7202

Analog and Digital I/O

User's Guide

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About this User's Guide

This document describes the Measurement Computing USB-7202 data acquisition device and lists device specifications.

Conventions

For more information

Text presented in a box signifies additional information related to the subject matter.

Caution! Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.

bold text — **Bold** text is used for the names of objects on a screen, such as buttons, text boxes, and check boxes.

italic text — *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase.

Where to find more information

Additional information about USB-7202 hardware is available on our website at www.mccdaq.com. You can also contact Measurement Computing Corporation with specific questions.

- Knowledgebase: kb.mccdaq.com
- Tech support form: www.mccdaq.com/support/support_form.aspx
- Email: techsupport@mccdaq.com
- Phone: 508-946-5100 and follow the instructions for reaching Tech Support

For international customers, contact your local distributor. Refer to the International Distributors section on our website at www.mccdaq.com/International.

Introducing the USB-7202

The USB-7202 is a USB 2.0 full-speed device that provides the following features:

- Eight channels of 16-bit analog input
  - 100 kS/s max total throughput (200 kS/s with BURSTIO enabled), 50 kS/s on any one channel
  - Simultaneous sampling (1 A/D converter per input)
  - Independently configurable input ranges
- Eight individually configurable digital I/O channels
- 32-bit event counter
- Digital trigger input
- Bidirectional SYNC pin for external clocking and synchronization with another board
- USB/104 form factor
- Stackable 3.55" x 3.75" board dimensions

The USB-7202 device is compatible with both USB 1.1 and USB 2.0 ports. The speed of the device may be limited when using a USB 1.1 port due to the difference in transfer rates on the USB 1.1 versions of the protocol (low-speed and full-speed).

The USB-7202 is powered by the +5 volt USB supply from your computer; no external power is required. The device is compatible with both USB 1.1 and USB 2.0 ports. A USB cable is shipped with the device.

Caution! There are no product safety, electromagnetic compatibility (EMC), or CE marking compliance claims made for the USB-7202. The USB-7202 is intended for use as a component of a larger system. MCC can help developers meet their compliance requirements. The end product supplier, however, is responsible for conforming to any and all compliance requirements.

Functional block diagram

USB-7202 functions are illustrated in the block diagram shown here.

Figure 1. Functional block diagram

Installing the USB-7202

Unpacking

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the device from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

Contact us immediately if any components are missing or damaged.

Installing the software

Refer to the MCC DAQ Quick Start for instructions on installing the software on the MCC DAQ CD. Refer to the device product page on the Measurement Computing website for information about the included and optional software supported by the USB-7202.

Install the software before you install your device

The driver needed to run the USB-7202 is installed with the software. Therefore, you need to install the software package you plan to use before you install the hardware.

Installing the hardware

There are two ways to connect the USB-7202 to your system:

- Connect a USB cable from the **USB** connector to either a USB port on the computer or to an external USB hub connected to the computer. No external power is required.

or

- Use a 2.54 mm (0.1 in.) box header to connect with the OEM connector. The connector pinout is shown here:

Pin	Signal Name	Pin	Signal Name
1	N/C	2	VBUS
3	N/C	4	D–
5	N/C (do not connect anything to this pin)	6	D+
7	N/C (do not connect anything to this pin)	8	GND
9	N/C (do not connect anything to this pin)	10	SHIELD

When you connect the USB-7202 for the first time, a **Found New Hardware** message opens as the device is detected. The installation is complete when the message closes.

After the USB-7202 is installed, the **Power** LED remains on to indicate that communication is established between the USB-7202 and your computer.

Caution! Do not disconnect any device from the USB bus while the computer is communicating with the USB-7202, or you may lose data and/or your ability to communicate with the USB-7202.

If the Power LED turns off

If the **Power** LED is on but then turns off, the computer has lost communication with the USB-7202. To restore communication, disconnect the USB cable from the computer, and then reconnect it. This should restore communication, and the **Power** LED should turn on.

Calibrating the hardware

Factory calibration

The Measurement Computing Manufacturing Test department performs the initial factory calibration. Contact Measurement Computing for details about how to return your device and have it calibrated to the factory specifications.

Field calibration

The USB-7202 supports field calibration. Calibrate the device using InstaCal whenever the ambient temperature changes by more than ±10 °C from the last calibration.

Functional Details

Analog input acquisition modes

The USB-7202 can acquire analog input data in three different modes – software paced, hardware paced, or BURSTIO.

Software paced

You can acquire one analog sample at a time in software paced mode. You initiate the A/D conversion by calling a software command. The analog value is converted to digital data and returned to the computer. You can repeat this procedure for each channel desired until you have the total number of samples that you want from each channel.

The maximum throughput sample rate in software paced mode is about 250 S/s, but may vary depending on your system. You may receive OVERRUN errors at higher rates on some platforms. Using the BURSTIO mode should resolve these problems.

Hardware paced

You can acquire data from up to eight channels simultaneously in hardware paced mode. The analog data is continuously acquired and converted to digital values until you stop the scan. Data is transferred in blocks of up to 32 samples from the USB-7202 to the memory buffer on your computer.

The maximum sampling rate is an aggregate rate, where the total sample rate for all channels is 100 kS/s divided by the number of channels, with a maximum rate of 50 kS/s for any channel. Using this equation, you can acquire data with the USB-7202 from one channel at 50 kS/s, two channels at 50 kS/s each, four channels at 25 kS/s each, and so on, up to eight channels at 12.5 kS/s each. You can start a hardware paced scan with either a software command or with an external hardware trigger event.

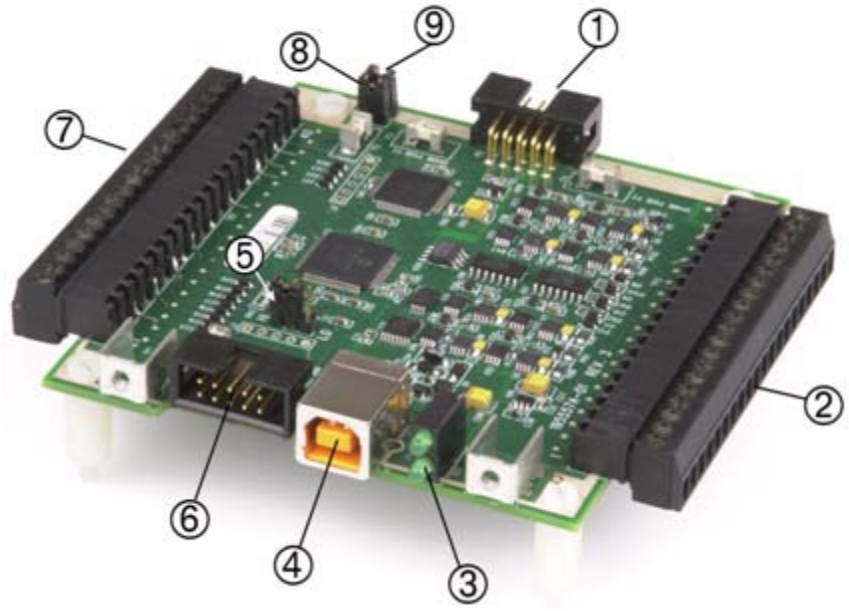
BURSTIO

When using BURSTIO, the USB-7202 can acquire data using the full capacity of its 32 kilosample FIFO. The acquired data is then read from the FIFO and transferred to a user memory buffer on the computer. You can initiate a single acquisition sequence for any number of input channels with either a software command or with an external hardware trigger.

When BURSTIO is enabled, scans are limited to the depth of the onboard memory, as the data is acquired at a rate faster than it can be transferred to the computer. The maximum sampling rate is an aggregate rate, where the total acquisition rate for all channels is 200 kS/s divided by the number of channels. The maximum rate for each channel is 50 kS/s. The maximum rate that you can acquire data using BURSTIO is 50 kS/s per channel for one, two, or four channels, and 25 kS/s per channel for eight channels.

Board components

The USB-7202 components are shown in Figure 2.



1	Trigger/Sync connector	4	USB connector Pins 1-20	7	Pins 21-40
2	Pins 1-20 Trigger jumper (P6)	5	Pull-up/down jumper JP1	8	Trigger jumper (P7)
3	Power LED (top) and Status LED (bottom)	6	OEM connector	9	Sync jumper (P6)

Figure 2. Board components

USB connector

The USB connector provides +5 V power and communication. The voltage supplied through the USB connector is system-dependent, and may be less than 5 V. No external power supply is required.

This connector operates in parallel with the OEM connector — do not connect to both the USB connector and the OEM connector.

OEM connector

The OEM connector operates in parallel with the USB connector — do not connect to both the USB connector and the OEM connector.

The OEM connector is a 0.1" box header. Pins 2, 4, 6, 8, and 10 provide a USB connection, as listed in the connector pinout below:

OEM connector pinout

Pin	Signal Name	Pin	Signal Name
1	N/C	2	VBUS
3	N/C	4	D-
5	N/C (do not connect anything to this pin)	6	D+
7	N/C (do not connect anything to this pin)	8	GND
9	N/C (do not connect anything to this pin)	10	SHIELD

Modifications are required in order to use the OEM connector

We recommend that you return the device to the factory for this modification.

Should you have the capabilities to perform the modifications, the following change is required: in order to create a USB connection via the OEM connector, locations R30and R36 must be populated. We recommend that you populate with 0603 size 0 Ω resistors or provide solder bridges to close the gaps.

Trigger/Sync connector

The Trigger/Sync connector provides two signals — SYNC and TRIG_IN. These signals are also available on the screw terminal (refer to Trigger input on page 14 for details about these signals).

Trigger/Sync connector pinout

Pin	Signal Name	Pin	Signal Name
1	TRIG_IN	2	GND
3	N/C	4	GND
5	SYNC	6	GND
7	N/C	8	GND
9	N/C	10	N/CD

Use a 0.1" box header when making connections to the Trigger/Sync connector.

The Trigger/Sync connector internally connects its SYNC and TRIG_IN pins to the screw terminal via jumpers **P6** and **P7**.

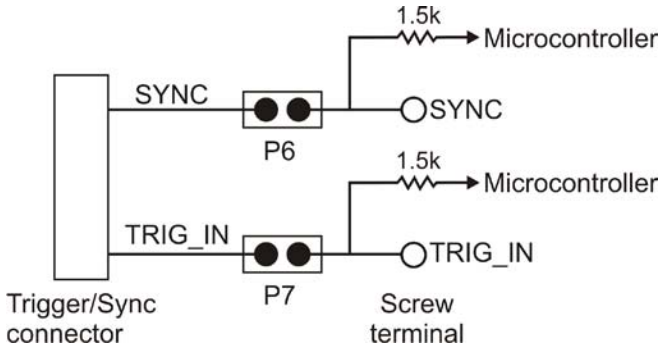


Figure 3. Jumper P6 and P7 schematic

Sync jumper (P6)

The Sync jumper internally connects the SYNC pin on the Trigger/Sync connector to the SYNC pin on the screw terminal. Remove this jumper on boards that will not send/receive the SYNC signal through the SYNC/TRIG connector. Refer to Figure 2 on page 11 for the location of this jumper.

Trigger jumper (P7)

The Trigger jumper internally connects the TRIG_IN pin on the Trigger/Sync connector to the TRIG_IN pin on the screw terminal. Remove this jumper on boards that will not send/receive the TRIG signal through the SYNC/TRIG connector. Refer to Figure 2 on page 11 for the location of this jumper.

LED indicators

The USB-7202 has LEDs for power and communication status. See Figure 2 on page 11 for the location of each LED.

LED type	Indication
Power	Steady green: The device microcontroller is connected to a computer or external USB hub.
Status	Blinking green: data is being transferred over the USB bus.

Screw terminals

Screw terminal connections in shown in Figure 4.

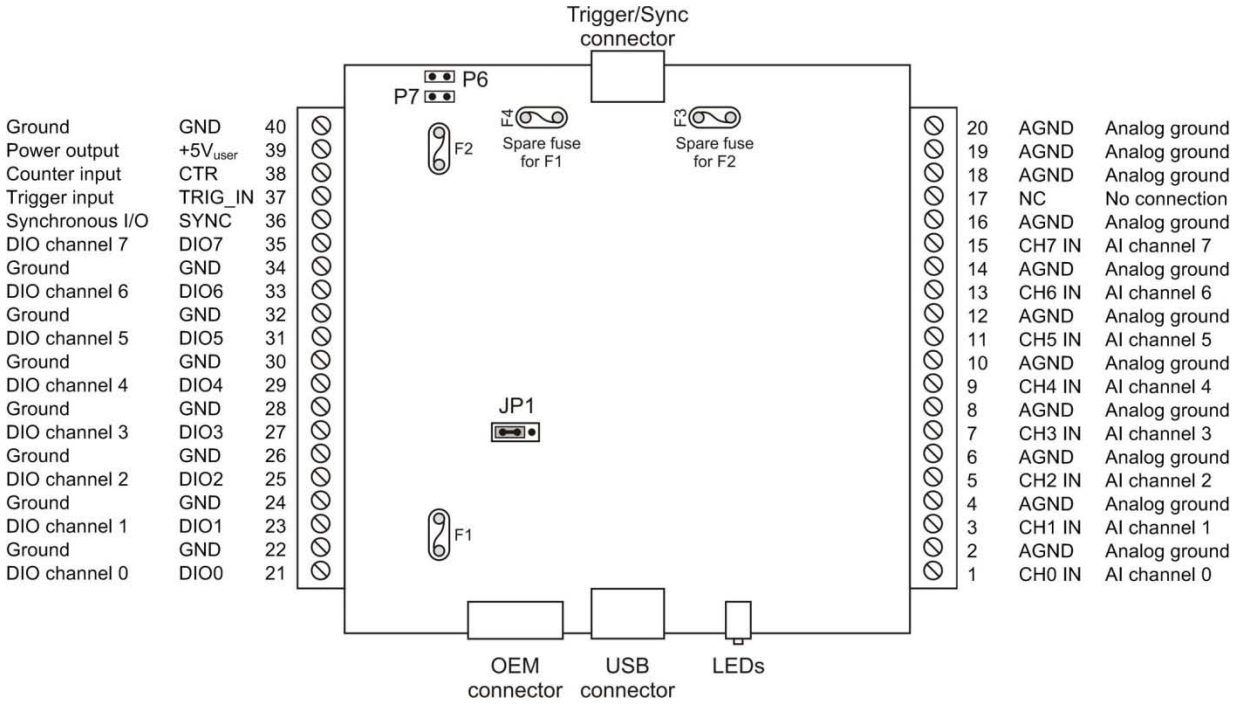


Figure 4. Screw terminal pinout

Use 16 AWG to 30 AWG when making screw terminal connections.

Signal connections

Analog input

You can connect up to eight analog input connections to screw terminals **CH0 IN** through **CH7 IN**. Connect unused analog input terminals to ground terminals during operation. All AI channels are configured for single-ended input mode. The input voltage ranges are ±10 V, ±5 V, ±2.0 V, ±1.0 V.

Each analog signal is referenced to signal ground (AGND), and requires two wires:

- The wire carrying the signal to be measured connects to CH# IN.
- The second wire connects to AGND.

Digital I/O

You can connect up to eight digital I/O lines to screw terminals **DIO0** to **DIO7**. Each digital bit is configurable as either input or output. When configured for input, the digital I/O terminals can be used to detect the state of any TTL-level input.

Pull-up/down configuration

The digital pins are configurable via jumper **JP1** for pull-up to USB +5 V (HI) or pull-down to ground (LO). On power up and reset the DIO pins are driven high.

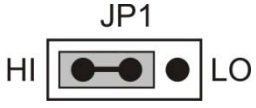


Figure 5. Jumper JP1 configuration

For more information on signal connections

For general information regarding digital signal connections and digital I/O techniques, refer to the *Guide to DAQ Signal Connections* (available on our website at www.mccdaq.com/signals/signals.pdf).

SYNC I/O

The **SYNC** connection is a bidirectional I/O signal that can be configured as an input (default) or an output.

- Configure as an external clock input to pace the A/D conversions from an external source. The SYNC terminal supports TTL-level input signals of up to 50 kHz.
- Configure as an output to pace conversions on a second USB-7202.

The SYNC pin on the screw terminal is internally connected to the SYNC pin on the Trigger/Sync connector (see page 12).

Trigger input

Use the digital trigger input (**TRIG_IN**) to start an acquisition when a rising or falling edge is detected on the signal. This pin is internally connected to the TRIG_IN pin on the Trigger/Sync connector (see page 12).

Counter input

The **CTR** connection is a TTL-level input to a 32-bit event counter. The internal counter increments when the TTL level transitions from low to high. The counter can count frequencies of up to 1 MHz.

Power output

The **+5VUSER** connection is a 5 volt output that is supplied by the host computer.

Caution! Do not connect to an external power supply to this terminal or you may damage the USB-7202 and possibly the computer.

The maximum total output current that can be drawn from all USB-7202 connections (power, analog, and digital outputs) is 500 mA. This maximum applies to most personal computers and self-powered USB hubs. Bus-powered hubs and notebook computers may limit the maximum available output current to 100 mA.

The USB-7202 alone draws 150 mA of current from the USB +5 V supply. Once you start running applications with the USB-7202, each DIO bit can draw up to 2.5 mA. The maximum amount of +5 V current available for experimental use, over and above that required by the USB-7202, is the difference between the *total current requirement* of the USB-7202 (based on the application) and the *allowed current draw* of the computer platform (500 mA for desktop computers and self-powered hubs). It shall not exceed 375 mA, based on the Slo-Blo Fuse current rating connected to the +5V terminal.

With all outputs at their maximum output current, you can calculate the total current requirement of the USB-7202 USB +5 V as follows:

(USB-7202 @ 150 mA) + (8 DIO @ 2.5 mA ea) = 170 mA

For an application running on a computer or powered hub, the maximum available excess current is 500 mA − 170 mA = 330 mA. This number is the total maximum available current at the **+5VUSER** screw terminal. Measurement Computing highly recommends that you figure in a safety factor of 20% below this maximum current loading for your applications. A conservative, safe user maximum in this case would be in the 250 mA to 300 mA range.

Since some laptop computers running on battery power only allow up to 100 mA, the USB-7202 may be above that allowed by the computer. In this case, you must either purchase a self-powered hub or operate the laptop computer from an external power adapter.

Ground

The analog ground (**AGND**) terminals provide a common ground for all analog channels. The digital ground (**GND**) terminals provide a common ground for the digital, trigger, counter, and sync channels and the power terminal.

Accuracy

The overall accuracy of any instrument is limited by the error components within the system. Quite often, resolution is incorrectly used to quantify the performance of a measurement product. While "16-bits" or "1 part in 65,536" does indicate what can be resolved, it provides little insight into the quality, or accuracy, of an absolute measurement. Accuracy specifications describe the actual measurement that can be relied upon with a USB-7202.

There are three types of errors which affect the accuracy of a measurement system:

- offset
- gain
- nonlinearity

The primary error sources in the USB-7202 are offset and gain. Nonlinearity is small in the USB-7202, and is not significant as an error source with respect to offset and gain.

Figure 6 shows an ideal, error-free, USB-7202 transfer function. The typical calibrated accuracy of the USB-7202 is range-dependent, as explained in the *Specifications* chapter on page 19. We use a ±10 V range as an example of what you can expect when performing a measurement in this range.

The accuracy plots in Figure 6 are drawn for clarity and are not drawn to scale.

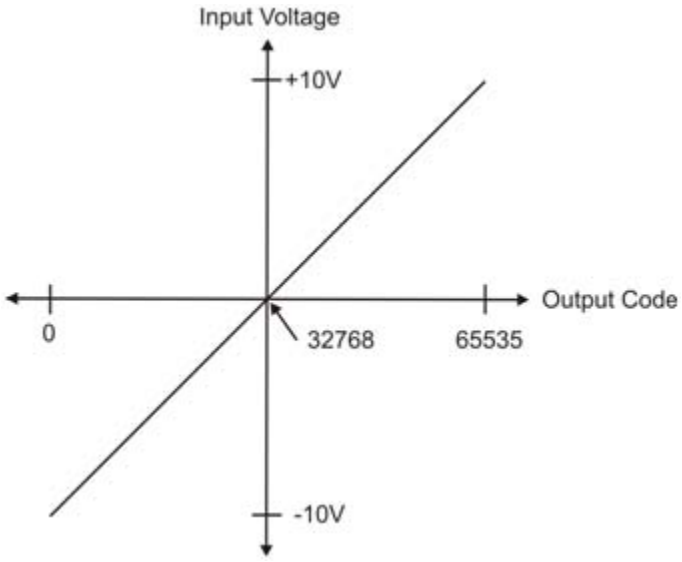


Figure 6. Ideal ADC transfer function

The USB-7202 offset error is measured at mid-scale. Ideally, a zero volt input should produce an output code of 32,768. Any deviation from this is an offset error. Figure 7 shows the USB-7202 transfer function with an offset error. The typical offset error specification for the USB-7202 on the ±10 V range is ±1.66 mV. Offset error affects all codes equally by shifting the entire transfer function up or down along the input voltage axis.

The accuracy plots in Figure 7 are drawn for clarity and are not drawn to scale.

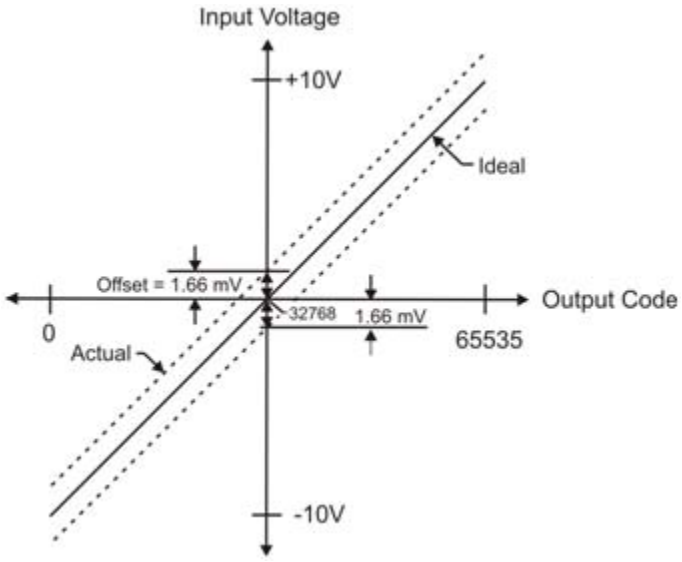


Figure 7. ADC transfer function with offset error

Gain error is a change in the slope of the transfer function from the ideal, and is typically expressed as a percentage of full-scale. Figure 8 shows the USB-7202 transfer function with gain error. Gain error is easily converted to voltage by multiplying the full-scale input (±10 V) by the error.

The accuracy plots in Figure 8 are drawn for clarity and are not drawn to scale.

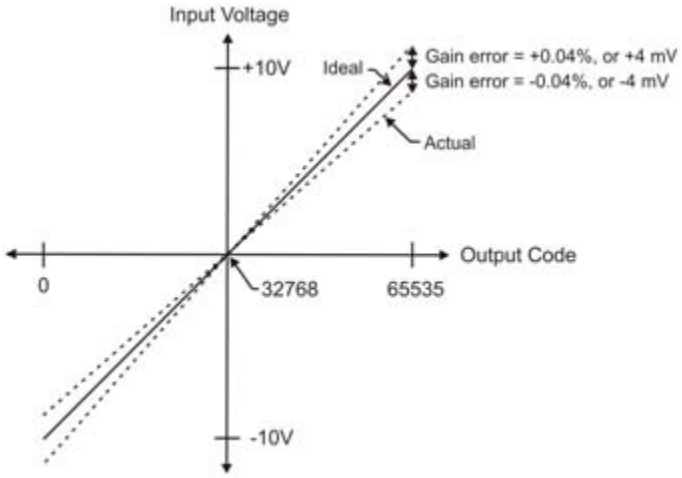


Figure 8. ADC Transfer function with gain error

For example, the USB-7202 exhibits a typical calibrated gain error of ±0.04% on all ranges. For the ±10 V range, this would yield 10 V × ±0.0002 = ±4 mV. This means that at full scale, neglecting the effect of offset for the moment, the measurement would be within 4 mV of the actual value. Note that gain error is expressed as a ratio. Values near ±FS (±10 V) are more affected from an absolute voltage standpoint than are values near mid-scale, which see little or no voltage error.

Combining these two error sources in Figure 9, we have a plot of the error band of the USB-7202 at ±full scale (±10 V). This plot is a graphical version of the typical accuracy specification of the product.

The accuracy plots in Figure 9 are drawn for clarity and are not drawn to scale.

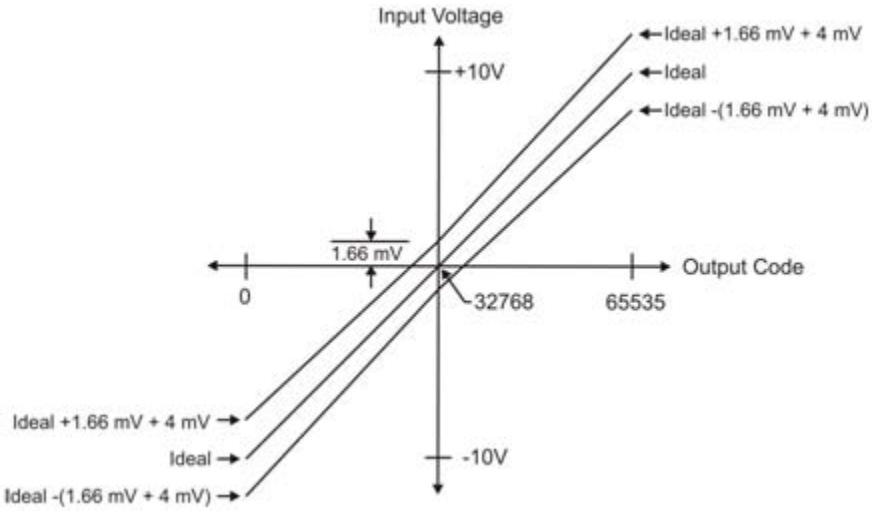


Figure 9. Error band plot

Synchronized operations

You can connect the SYNC pin of two USB-7202 devices together in a master/slave configuration and acquire data from the analog inputs of both devices using one clock. When the SYNC pin is configured as an output, the internal A/D pacer clock signal is sent to the screw terminal. If jumper P6 is installed, you can output the clock to the SYNC pin of a second USB-7202 configured for A/D pacer input.

The SYNC pin is available on both the screw terminal connector and on the Trigger/SYNC connector (when jumper P6 is installed). Refer to page 14 for more information about the SYNC pin.

Mechanical drawing

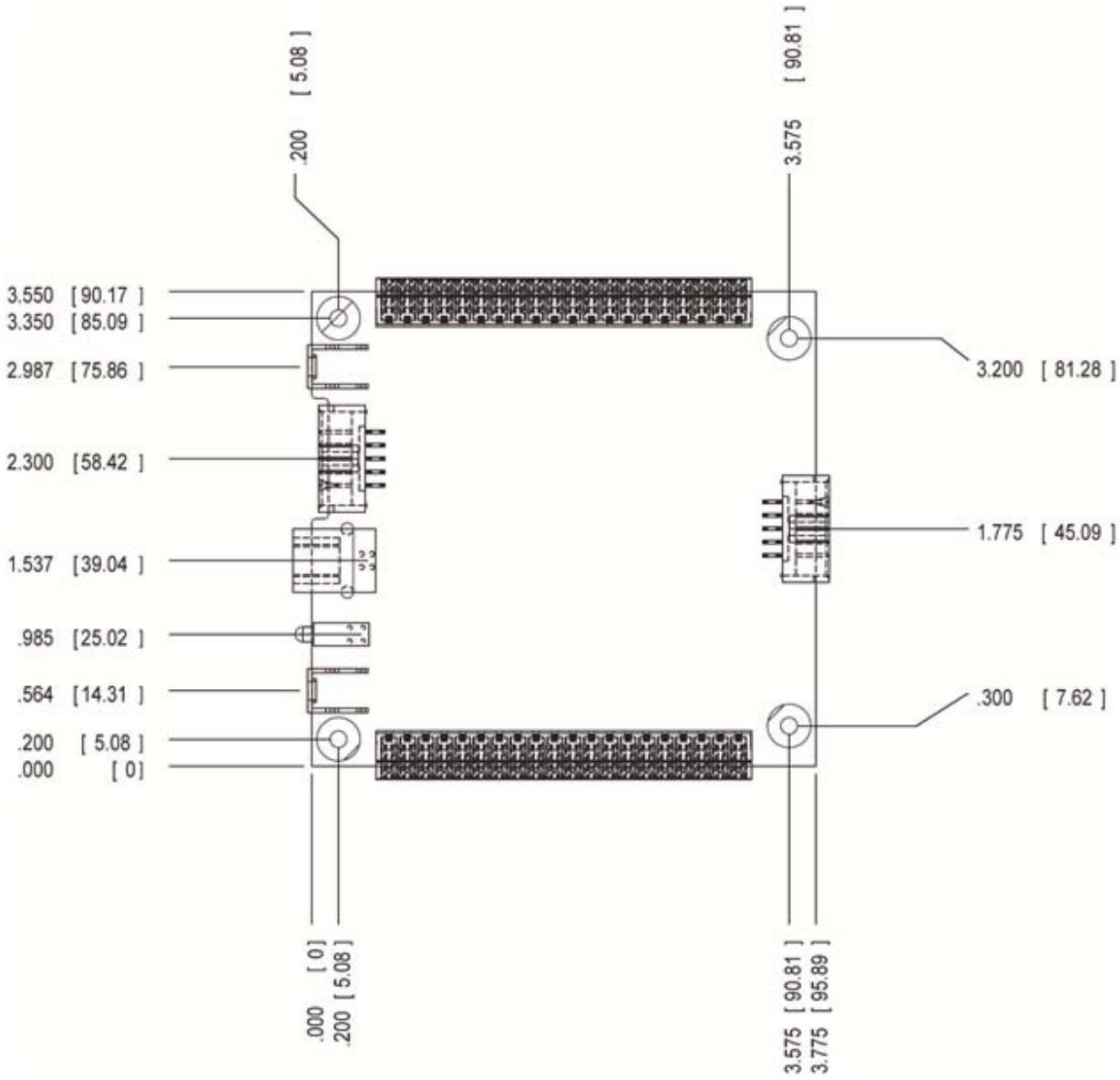


Figure 10. Circuit board dimensions

Specifications

All specifications are subject to change without notice.
Typical for 25 °C unless otherwise specified.
Specifications in *italic text* are guaranteed by design.

Analog input

Table 1. Analog input specifications

Parameter	Conditions	Specification
A/D converter type		16-bit successive approximation type
Number of channels		8 single-ended
Input configuration		Individual A/D per channel
Sampling method		Simultaneous
Absolute maximum input voltage	*CHx IN to GND*	*±15 V max*
Input impedance		100 MΩ min
Input ranges	Software-selectable	±10 V, ±5 V, ±2 V, ±1 V
Sampling rate	Scan to system memory	0.6 S/s to 50 kS/s, software-selectable
	BURSTIO scan to 32 k sample FIFO	20 S/s to 50 kS/s, software-selectable
Throughput	Software paced	500 S/s all channels, system-dependent
	Scan to system memory (Note 1)	(100 kS/s) / (# of channels); maximum of 50 kS/s for any channel
	BURSTIO scan to 32 k Sample FIFO	(200 kS/s) / (# of channels), maximum of 50 kS/s for any channel
Resolution		16 bits
No missing codes		*15 bits*
Crosstalk	Signal DC–25 kHz	–80 dB
Trigger source	Software-selectable	External digital: TRIG_IN
Calibration		Cal factors stored in firmware. Cal factors must be applied to data via application software.

Note 1: Maximum throughput scanning to system memory is machine dependent.

Table 2. Calibrated absolute accuracy

Range	Accuracy (mV)
±10 V	5.66
±5 V	2.98
±2 V	1.31
±1 V	0.68

Table 3. Accuracy components - All values are (±)

Range	% of Reading	Gain error at FS (mV)	Offset (mV)
±10 V	0.04	4.00	1.66
±5 V	0.04	2.00	0.98
±2 V	0.04	0.80	0.51
±1 V	0.04	0.40	0.28

Table 4 summarizes the noise performance for the USB-7202. Noise distribution is determined by gathering 50 K samples with inputs tied to ground at the user connector. Samples are gathered at the maximum specified sampling rate of 50 kS/s.

Table 4. Noise performance

Range	Typical counts	LSBrms
±10 V	10	1.52
±5 V	10	1.52
±2 V	11	1.67
±1 V	14	2.12

Digital input/output

Table 5. Digital I/O specifications

Parameter	Specification
Digital type	CMOS
Number of I/O	8 (DIO0 through DIO7)
Configuration	Independently configured for input or output
Pull-up/pull-down configuration	All pins configurable via jumper (JP1) to Vs or ground via 47 kΩ resistors.
Input high voltage	2.0 V min, 5.5 V absolute max
Input low voltage	0.8 V max, –0.5 V absolute min
Output high voltage (IOH = –2.5 mA)	3.8 V min
Output low voltage (IOL = 2.5 mA)	0.7 V max
Power on and reset state	Input

External trigger

Table 6. External trigger specifications

Parameter	Conditions	Specification
Trigger source (Note 2)	External digital	TRIG_IN
Trigger mode	Software-selectable	Edge sensitive: user configurable for CMOS compatible rising or falling edge.
Trigger latency		10 µs max
Trigger pulse width		1µs min
Input high voltage		4.0 V min, 5.5 V absolute max
Input low voltage		1.0 V max, –0.5 V absolute min
Input leakage current		*±1.0µA*

Note 2: TRIG_IN is a Schmitt trigger input protected with a 1.5K Ohm series resistor.

External clock input/output

Table 7. External clock I/O specifications

Parameter	Conditions	Specification
Pin name		SYNC
Pin type		Bidirectional
Software-selectable direction	Output	Outputs internal A/D pacer clock.
	Input	Receives A/D pacer clock from external source.
Input clock rate		50 kHz, max
Clock pulse width	Input	1µs min
	Output	5µs min
Input leakage current		*±1.0µA*
Input high voltage		4.0 V min, 5.5 V absolute max
Input low voltage		1.0 V max, –0.5 V absolute min
Output high voltage (Note 3)	IOH = –2.5 mA	3.3 V min
	No load	3.8 V min
Output low voltage (Note 3)	IOL = 2.5 mA	1.1 V max
	No load	0.6 V max

Note 3: SYNC is a Schmitt trigger input and is over-current protected with a 1.5 kΩ series resistor.

Counter

Table 8. Counter specifications

Parameter	Specification
Pin name (Note 4)	CTR
Counter type	Event counter
Number of channels	1
Input type	TTL, rising edge triggered
Input source	CTR screw terminal
Resolution	32 bits
Schmidt trigger hysteresis	*20 mV to 100 mV*
Input leakage current	*±1µA*
Input frequency	1 MHz max
High pulse width	*500 ns min*
Low pulse width	*500 ns min*
Input high voltage	4.0 V min, 5.5 V absolute max
Input low voltage	1.0 V max, –0.5 V absolute min

Note 4: CTR is a Schmitt trigger input protected with a 1.5 kΩ series resistor.

Memory

Table 9. Memory specifications

Parameter	Specification		
Data FIFO	32,768 samples, 65,536 bytes		
EEPROM	1,024 bytes		
EEPROM configuration	**Address range**	**Access**	**Description**
	0x000-0x1FF	Reserved	512 bytes system and Cal data
	0x200-0x3FF	Read/write	512 bytes user area

Microcontroller

Table 10. Microcontroller specifications

Parameter	Specification
Type	*High performance 8-bit RISC microcontroller*
Program memory	*32,768 words*
Data memory	*3,936 bytes*

Indicator LEDs

Table 11. Indicator LED specifications

Parameter	Specification
Power LED (top)	Indicates that the device's microcontroller has power and is configured.
Status LED	Blinks to indicate USB communications.
OEM power	OEM Connector; LED sink current up to 5 mA per LED @ 5 Vmax

Power

Table 12. Power specifications

Parameter	Conditions	Specification
Supply current	USB enumeration	< 100 mA
	Continuous mode	150 mA (Note 5)
+5VUSER power available (Note 6)	■ Connected to self-powered hub ■ Connected to externally-powered root port hub	4.0 V min, 5.25 V max
Output current (Note 7)		350 mA max
Fuse F1, (F4 spare)	0452.500 - Littelfuse 0.5A NANO2® Slo-Blo® Subminiature Surface Mount Fuse	
Fuse F2, (F3 spare)	0452.375 - Littelfuse 0.375A NANO2® Slo-Blo® Subminiature Surface Mount Fuse	

Note 5: This is the total current requirement for the USB-7202, which includes up to 10 mA for the status LED.

Note 6: "Self-powered hub" refers to a USB hub with an external power supply. Self-powered hubs allow a connected USB device to draw up to 500 mA. "Root port hubs" reside in the computer USB host Controller. The USB port(s) on your computer are root port hubs. All externally-powered root port hubs (desktop computers) provide up to 500 mA of current for a USB device. Battery-powered root port hubs provide 100 mA or 500 mA, depending upon the manufacturer. A laptop computer that is not connected to an external power adapter is an example of a battery-powered root port hub. If your laptop computer is constrained to the 100 mA maximum, you need to purchase a self-powered hub.

Note 7: This is the total amount of current that can be sourced from the +5VUSER and digital outputs. Fuse for +5V terminal is rated at 375 mA.

General

Table 13. General specifications

Parameter	Specification	
Device type	USB 2.0 (full-speed)	
Device compatibility	USB 1.1, USB 2.0	
DEFAULTS for programmable options and "DEV:RESET/DEFAULT" message	AInScan	Low channel = 0 High channel = 0 Samples = 1000 Rate = 1000 Range = ±10 V Pacer = Disabled (Slave) Transfer mode = BlockIO Trigger = Disabled Status = Idle
	AITrig	Trigger polarity = Rising
	CTR	Value = 0

Environmental

Table 14. Environmental specifications

Parameter	Specification
Operating temperature range	0 °C to 70 °C
Storage temperature range	–40 °C to 70 °C
Humidity	0% to 90% non-condensing

Mechanical

Table 15. Mechanical specifications

Parameter	Specification
Dimensions (L × W × H)	90.17 × 95.25 × 12.70 mm (3.55 × 3.75 × 0.5 in.) 111.76 mm (4.40 in.) length with detachable screw terminals connected
USB cable length	*3 m (9.84 ft) max*
User connection length	*3 m (9.84 ft) max*

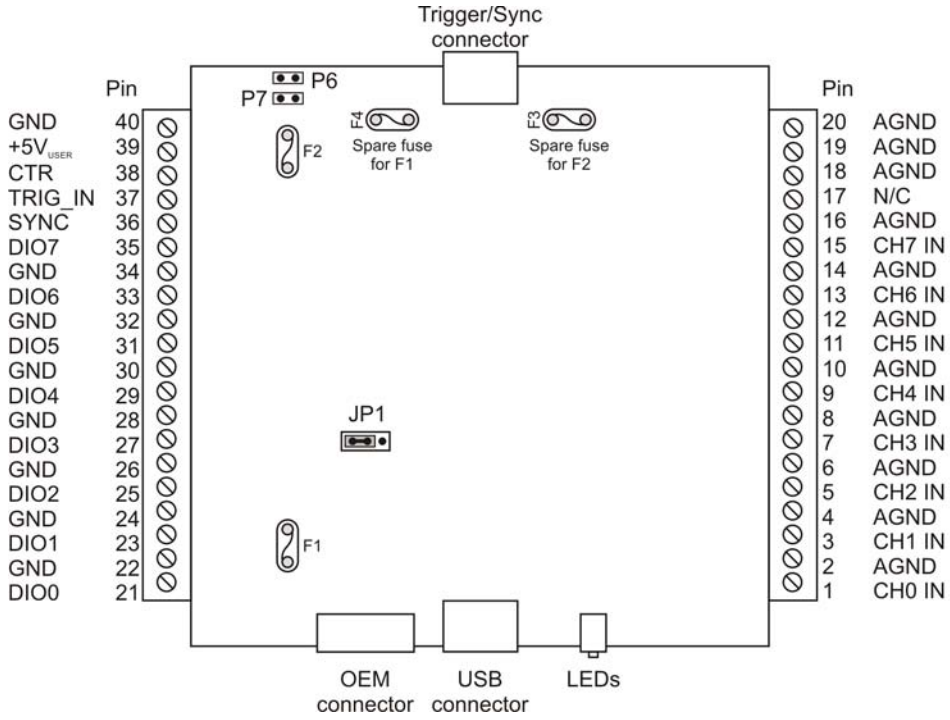
Screw terminal connector and pinout

Table 16. Connector specifications

Parameter	Specification
Connector type	Detachable screw terminal
Wire gauge range	16 AWG to 30 AWG

Table 17. Connector pinout

Pin	Signal Name	Pin	Signal Name
1	CH0 IN	21	DIO0
2	AGND	22	GND
3	CH1 IN	23	DIO1
4	AGND	24	GND
5	CH2 IN	25	DIO2
6	AGND	26	GND
7	CH3 IN	27	DIO3
8	AGND	28	GND
9	CH4 IN	29	DIO4
10	AGND	30	GND
11	CH5 IN	31	DIO5
12	AGND	32	GND
13	CH6 IN	33	DIO6
14	AGND	34	GND
15	CH7 IN	35	DIO7
16	AGND	36	SYNC
17	N/C (no connect)	37	TRIG_IN
18	AGND	38	CTR
19	AGND	39	+5VUSER
20	AGND	40	GND



OEM connector and pinout (P4)

Table 18. OEM connector specifications

Parameter	Specification
Connector type	10 position 2.54 mm (0.1 in.) box header

Table 19. OEM connector pinout

Pin	Signal Name	Pin	Signal Name
1	N/C	2	VBUS (fuse protected)
3	N/C	4	D–
5	N/C (do not connect anything to this pin)	6	D+
7	N/C (do not connect anything to this pin)	8	GND
9	N/C (do not connect anything to this pin)	10	SHIELD

Trigger/Sync connector and pinout (P5)

Table 20. Trigger/Sync connector specifications

Parameter	Specification
Connector type	10 position 2.54 mm (0.1 in.) box header

Table 21. Trigger/Sync connector pinout

Pin	Signal Name	Pin	Signal Name
1	TRIG_IN	2	GND
3	N/C	4	GND
5	SYNC	6	GND
7	N/C	8	GND
9	N/C	10	N/C

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